

REMARKS

The title has been amended to "LITHIUM SECONDARY BATTERY INCLUDING ANODE CONTAINING SUBSIDIARY ACTIVE MATERIAL". The new title is believed to be indicative of the present invention.

Claim 1 has been amended to include the limitations of claim 14 and claim 14 has been canceled.

Claims 1-6, 11-13, 15 and 16 are rejected under 35 U.S.C. 102(e) as being anticipated by Gao et al. (US 2002/0119373 A1) (hereinafter: "Gao"). Claims 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gao in view of Singhal et al. (U.S. Patent No. 6,827,921 B1) (hereinafter: "Singhal"). Claims 1-6, 13, 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koshiha et al. (U.S. Patent No. 5,545,468) (hereinafter: "Koshiha") in view of Gao. Claims 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koshiha and Gao as applied to claims 1-6, 13, 15 and 16 above, and further in view of Singhal.

These rejections have been avoided and are now moot in view of the amendment to claim 1 to include the limitations of claim 14. Removal of the rejections is in order.

Claim 14 is rejected in the Action under 35 U.S.C. 103(a) as being unpatentable over Gao as applied to claims 1-6, 11-13, 15 and

16 and as being unpatentable over the combination of Koshiba and Gao as applied to claims 1-6, 13, 15 and 16.

The position of the Office with respect to the rejections of claim 14 is that Gao and Koshiba (as modified by Gao) do not disclose the amount of subsidiary active material in the anode. However, the Office alleges that it would have been obvious to adjust the amount of the subsidiary active material in the anode because it is well known in the battery art that the charge/discharge capacity of the battery is determined by the amount of the anode active material, including subsidiary active material, in the battery.

Applicants respectfully submit that the prior art fails to provide the necessary motive to provide a subsidiary active material in the anode of the battery of Gao and, particularly, to provide a subsidiary active material in the anode of the battery of Gao in an amount as now specified in claim 1.

In the battery of the present invention, the subsidiary active material is a material for supplying lithium from the negative electrode to the positive electrode at a condition of overdischarge and is used in an amount sufficient to cause saturation of lithium occluding at the positive electrode to reduce an electrical potential of the positive electrode and terminate discharge of the

battery before an electrical potential of the negative electrode reaches the electrical potential at which copper is dissolved. Such amount is an amount as calculated by the expression now recited in claim 1. If the amount of subsidiary active material is less than the amount calculated by the expression in claim 1 as amended, copper dissolves and damages the battery.

Applicants respectfully submit that the inclusion of a subsidiary active material in the anode of the battery of Gao in an amount as recited in amended claim 1 is not obvious over Gao.

First, Gao does not disclose the inclusion in the anode of its battery of a material for supplying lithium from the negative electrode to the positive electrode at a condition of overdischarge in an amount sufficient to saturate lithium occluding at the positive electrode to reduce an electrical potential of the positive electrode and terminate discharge of the battery before an electrical potential of the negative electrode reaches the electrical potential at which copper is dissolved from the current collector. Gao simply discloses various materials useful as a host material for metallic lithium in the anode of its battery.

Second, since Gao does not recognize the concept of a subsidiary active material and does not recognize the problem of copper dissolving and damaging battery properties depending on the

negative electrode potential, there would not have been a motive for a person of ordinary skill in the art to limit an amount of a any particular active material in the anode so as to obtain the battery of the present invention.

It is clear that Gao does not recognize the concept of a subsidiary active material and of the problem of copper in a current collector dissolving and damaging battery properties depending on negative electrode potential. With the use of LiNiO_2 as a cathode active material (see paragraph [0006] of Gao), the positive electrode potential reaches the cut off voltage before the negative electrode potential reaches the voltage at which copper dissolves because the initial positive electrode charge/discharge efficiency of LiNiO_2 is very low. Therefore, LiNiO_2 does not have the problem discovered by the present inventors. However, the problem exists with the use of LiCoO_2 as the cathode active material (see paragraph [0006] of Gao), and the fact that the use of a subsidiary active material, particularly in an amount as recited in claim 1, is not disclosed in Gao is evidence that the problem of copper in a current collector dissolving and damaging battery properties was not recognized.

As noted above, the Office has taken the position that it would have been obvious to adjust the amount of "the subsidiary

active material in the anode" because it is well known in the battery art that the charge/discharge capacity of the battery is determined by the amount of the anode active material, including "subsidiary active material", in the battery. However, such optimization is not supported in the prior art because, as noted above, the use of a subsidiary active material as recited in claim 1 was not known or suggested by Gao (or other prior art). The Office has not explained why any particular material in Gao would be considered to be a subsidiary active material as recited in claim 1 or why a person of ordinary skill in the art would have been motivated to limit the amount of the material as recited in claim 1.

Additionally, even if it was well known that the charge/discharge capacity of a battery is determined by the amount of the anode active material, adjusting the amount of active material of the anode of the battery of Gao would not necessarily have limited the amount of a specific material so as to obtain a battery in which the negative electrode includes a subsidiary active material as recited in claim 1.

Removal of the 35 U.S.C. § 103(a) rejection of claim 14 over Gao to the extent that it is applicable to the claims as amended is in order and is requested.

Regarding the rejection of claim 14 over Koshiba and Gao, Koshiba is identified by the Office as disclosing a nonaqueous electrolyte battery which includes each of the limitations of the rejected claims except that Koshiba does not disclose that the current collector is copper. However, Koshiba discloses an anode that includes only a lithium titanate compound as the active material. The Office, without explanation, has labeled the lithium titanate as "subsidiary active material", but nothing in Koshiba provides any basis for identifying the lithium titanate as a subsidiary - as opposed to a primary - active material. The anode of the battery of Koshiba may contain carbon black as a conductive agent, but carbon black is not a main, or primary, active material and is not a carbon material "capable of occluding and releasing lithium" as recited in claim 1 of the present application. Carbon black does not occlude and release lithium ions to the extent to which carbon used as an active material does.

Therefore, optimization of the active material of the anode of the battery of Koshiba as modified by Gao as proposed by the Office will not result in a battery including a negative electrode as recited in the claims of the present application.

Removal of the 35 U.S.C. § 103(a) rejection of claim 14 over Koshiba and Gao to the extent that it is applicable to the claims as amended is also in order and is requested.

The foregoing is believed to be a complete and proper response to the Office Action dated June 13, 2006, and is believed to place this application in condition for allowance. If, however, minor issues remain that can be resolved by means of a telephone interview, the Examiner is respectfully requested to contact the undersigned attorney at the telephone number indicated below.

In the event that this paper is not considered to be timely filed, applicants hereby petition for an appropriate extension of time. The fee for any such extension may be charged to our Deposit Account No. 111833.

In the event any additional fees are required, please also charge our Deposit Account No. 111833.

Respectfully submitted,
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